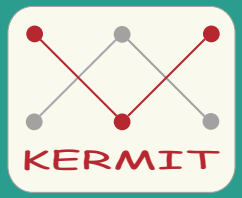

Automated recognition of people and identification of animal species in camera trap images

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Faculty of Bioscience Engineering
Ghent University

September 2018

Problem statement

Recognition of people and animals in camera trap images

Michiel Stock
Twitter: @michielstock

Citizen science vs privacy

Camera trap images

Image processing

Convolutional neural network

Conclusions

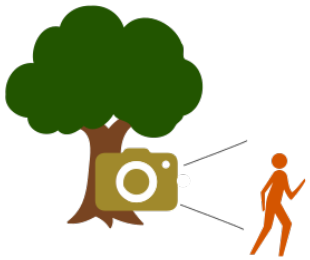
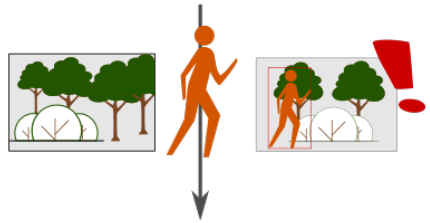


Image classification



Citizen science

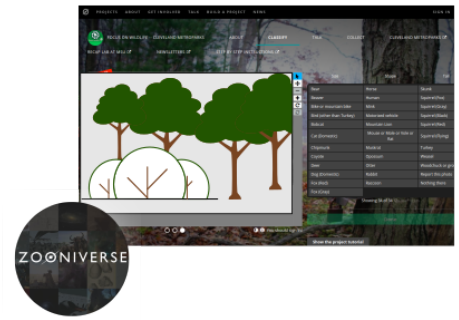


Image management

Open data publication

Camera trap images

- Camera trap survey
  - INBO and UHasselt
  - Hoge Kempen National Park

Camera trap images

- Camera trap survey
  - INBO and UHasselt
  - Hoge Kempen National Park

- Images
  - Motion detection
  - Sequences
  - Annotations

Image labels

Vernacular name	**Scientific name**	
Ass	*Equus asinus*	8
Beech Marten	*Martes foina*	17
Carrion Crow	*Corvus corone*	3
Common Pheasant	*Phasianus colchicus*	1
Domestic Cat	*Felis catus*	14
Domestic Dog	*Canis familiaris*	4
Eurasian Blackbird	*Turdus merula*	24
Eurasian Jay	*Garrulus glandarius*	1
Eurasian Red Squirrel	*Sciurus vulgaris*	6
European Hare	*Lepus europaeus*	10
Great Spotted Woodpecker	*Dendrocopos major*	1
Great Tit	*Parus major*	9
Greylag Goose	*Anser anser*	15
Horse	*Equus caballus*	30
House Sparrow	*Passer domesticus*	10
Long-tailed Field Mouse	*Apodemus sylvaticus*	8
Red Fox	*Vulpes vulpes*	236
Sheep	*Ovis aries*	9
Short-toed Treecreeper	*Certhia brachydactyla*	1
Song Thrush	*Turdus philomelos*	1
Western European Hedgehog	*Erinaceus europaeus*	2
Western Roe Deer	*Capreolus capreolus*	1282
Wild Boar	*Sus scrofa*	190
Human		27
Blank		2092
PickupSetup		308
Total		**4309**

Environmental conditions

ideal

fog

raindrops

poor illumination

Animal positioning

context occlusion

auto-occlusion

part of the animal

very close

far away

different animals

Hardware limitations

overexposed

blurred

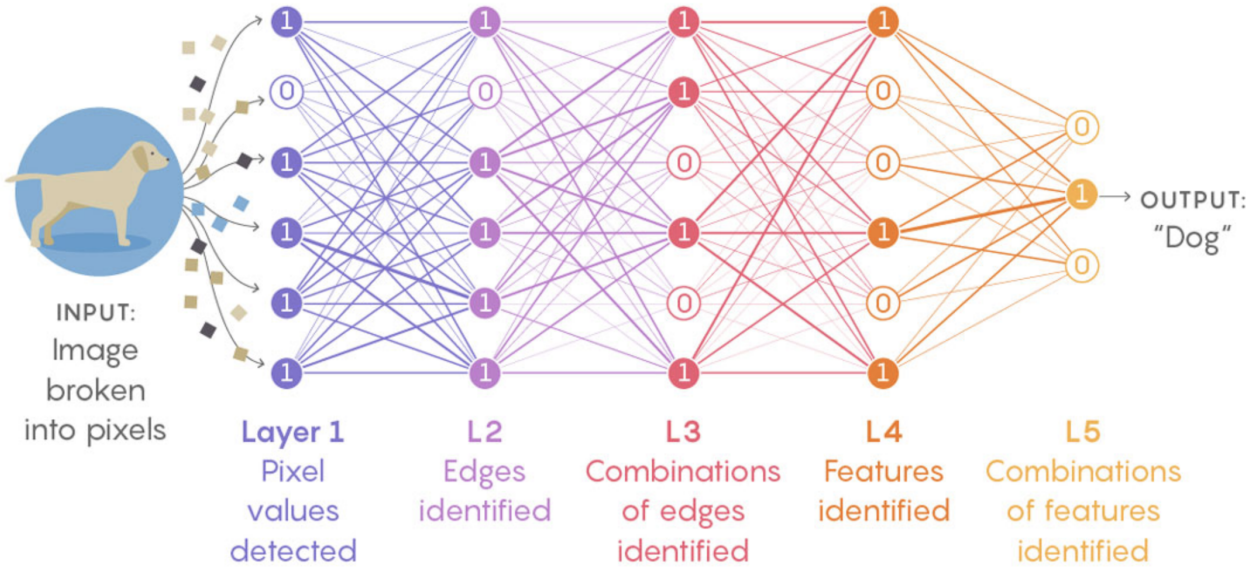
Image preprocessing

sequence

median →

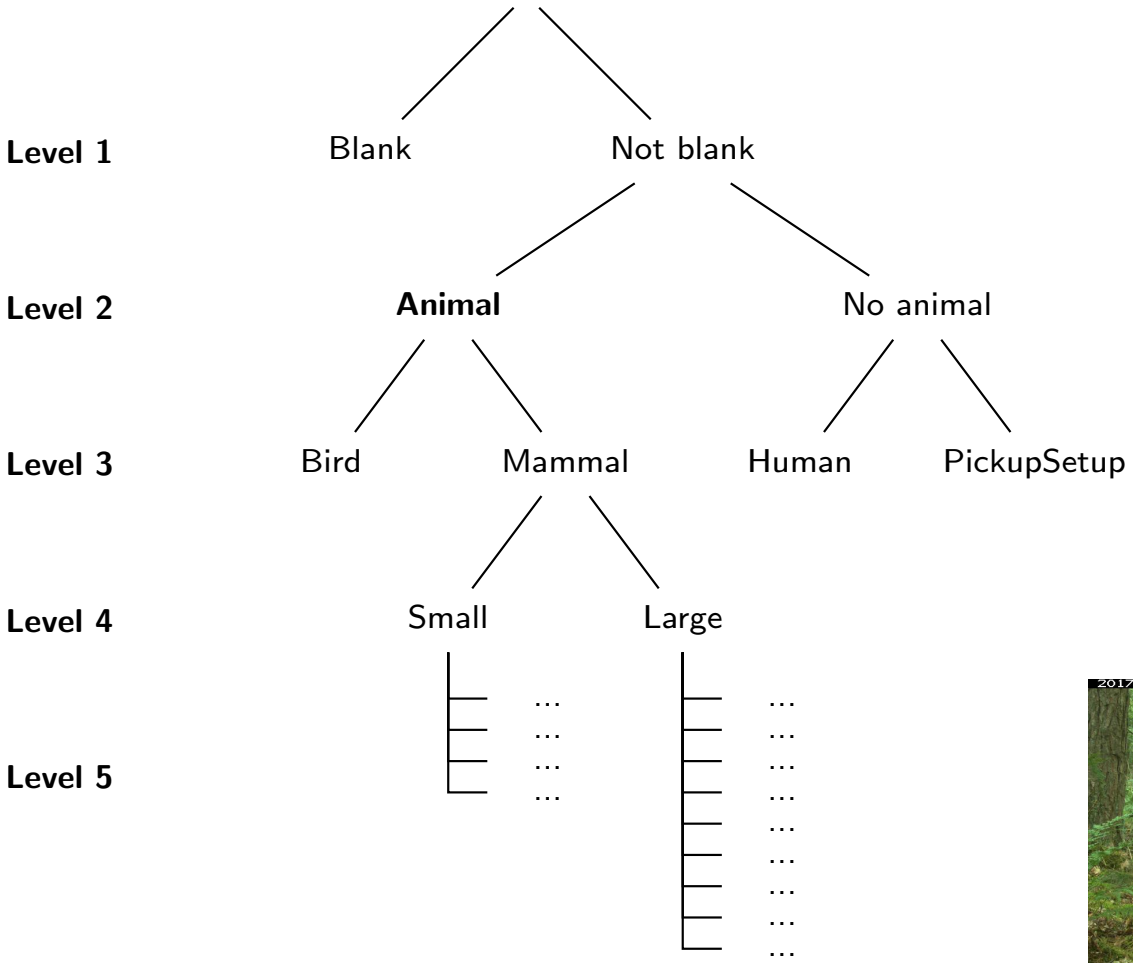
background

Convolutional neural network

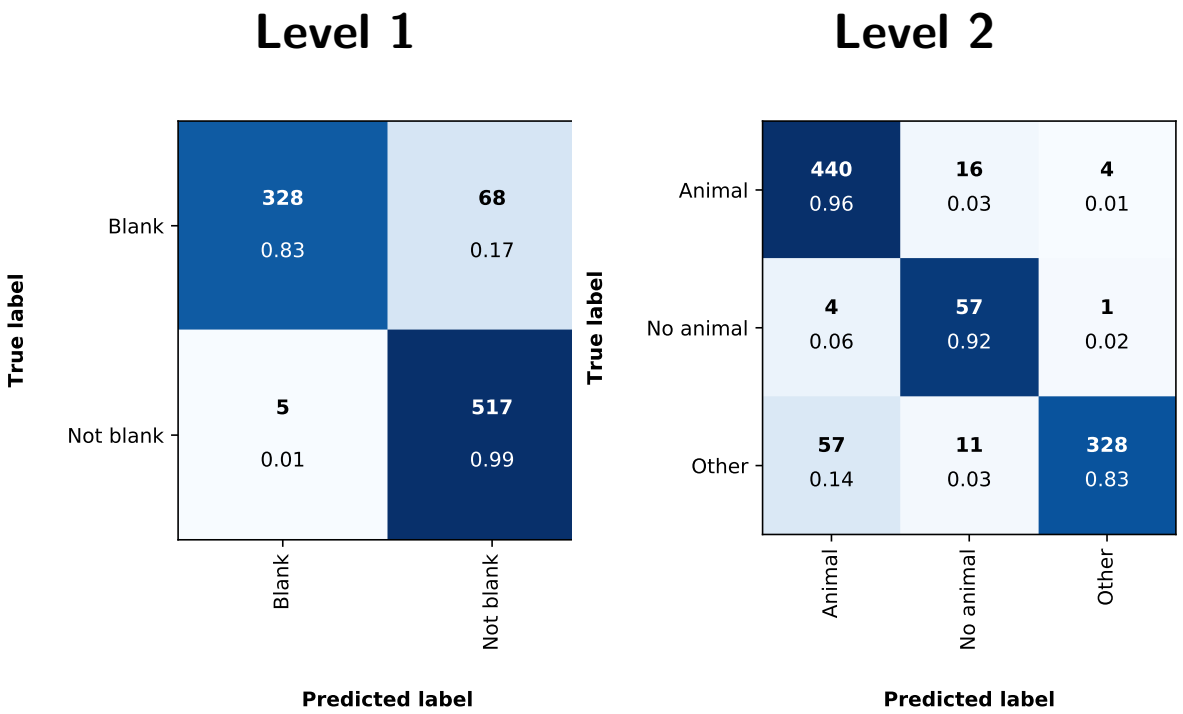


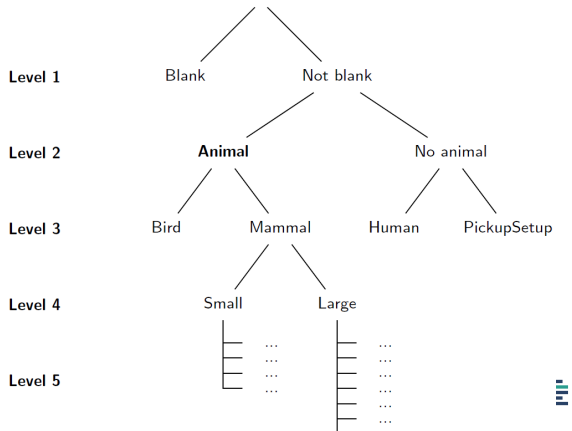
Lucy Reading-Ikkanda/Quanta Magazine

Hierarchical classification

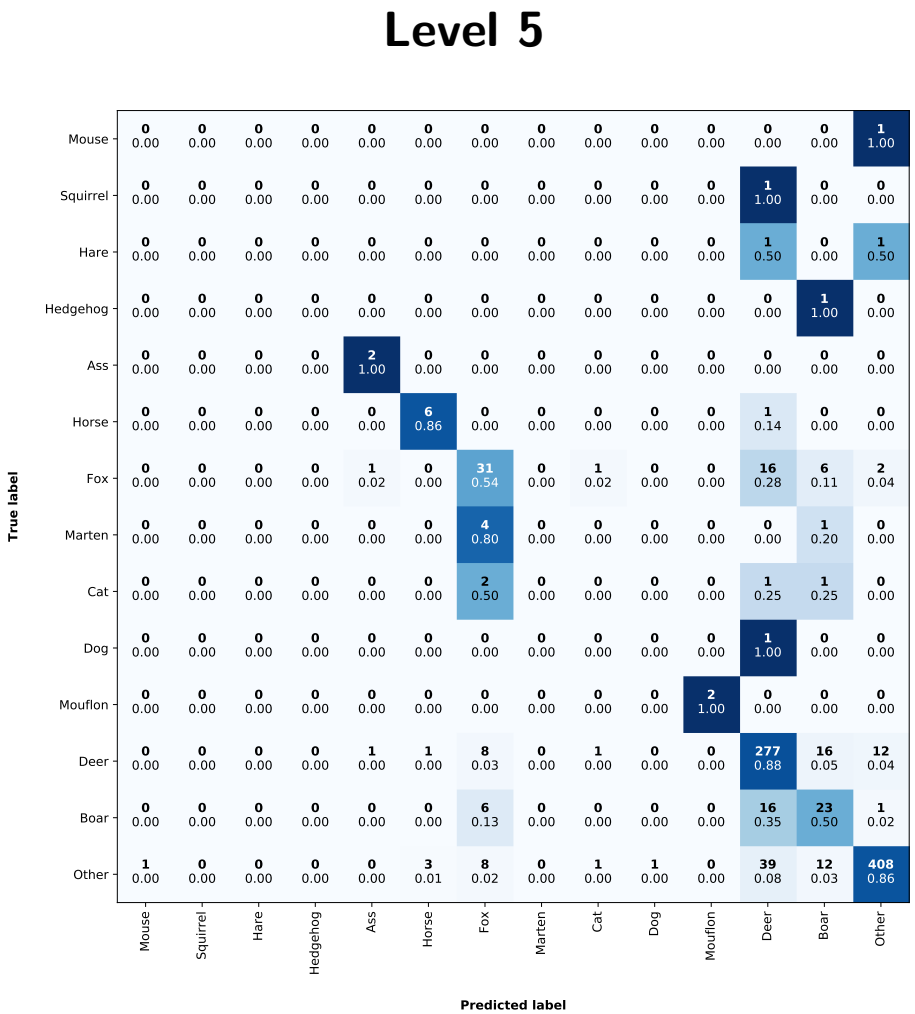


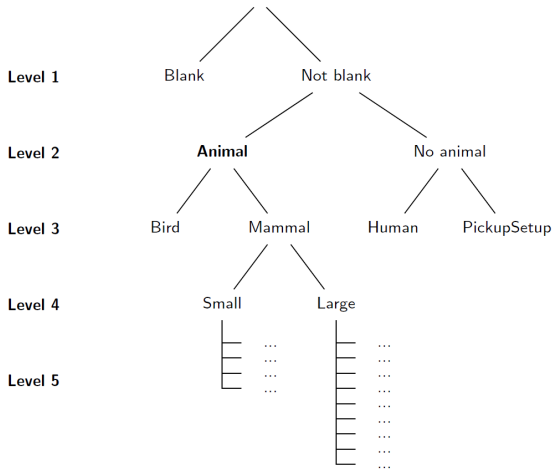
Neural network performance



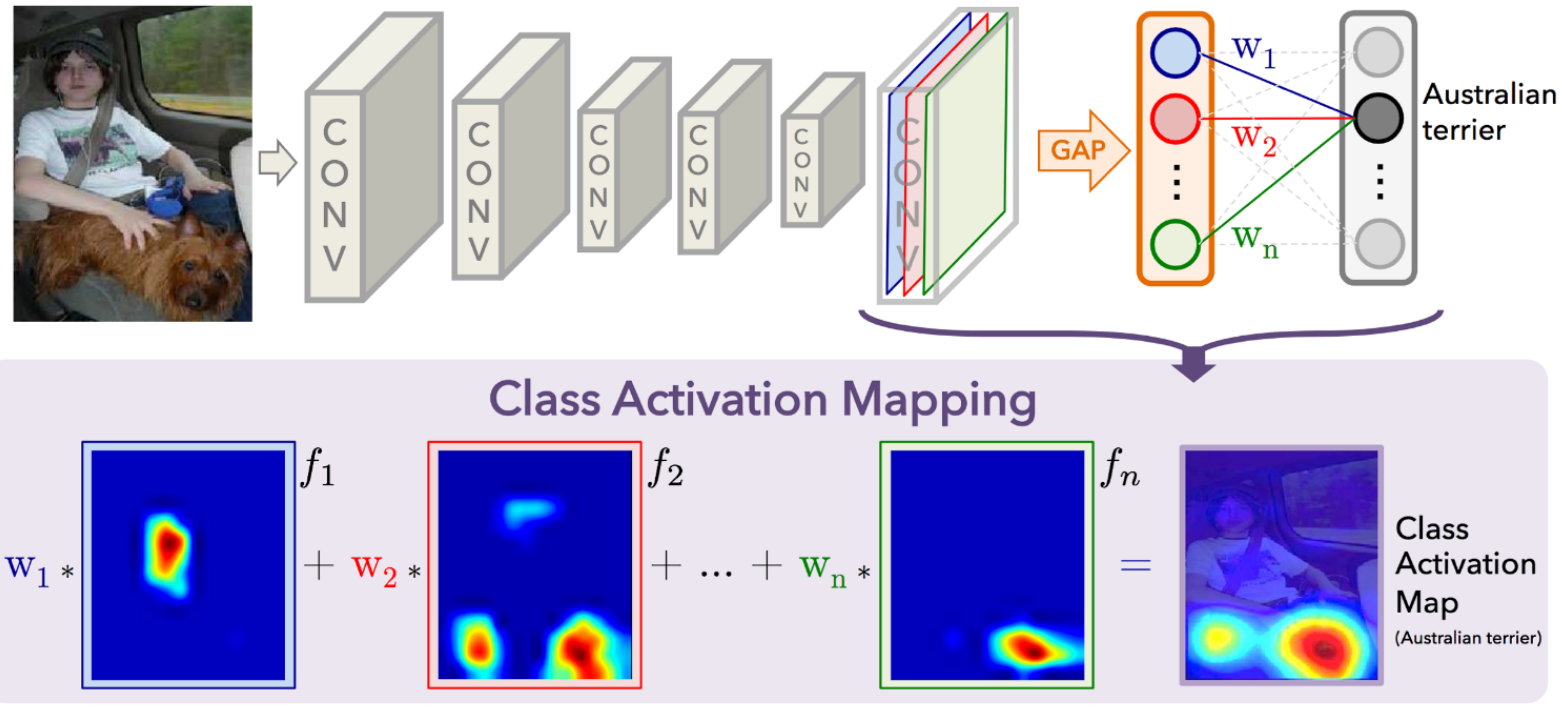


Neural network performance



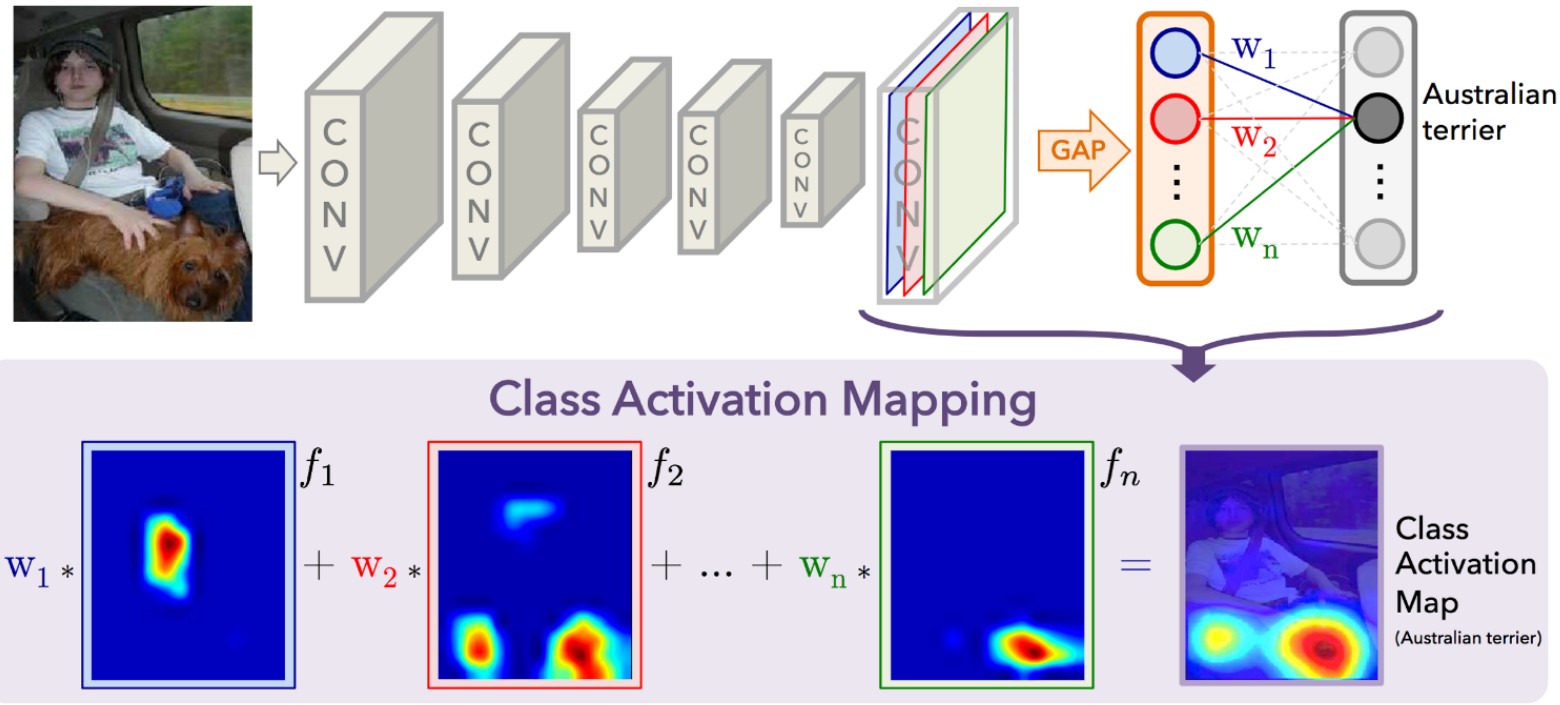


Class activation mapping

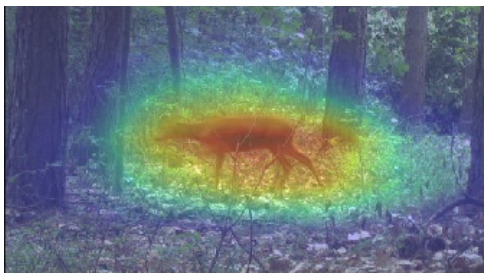


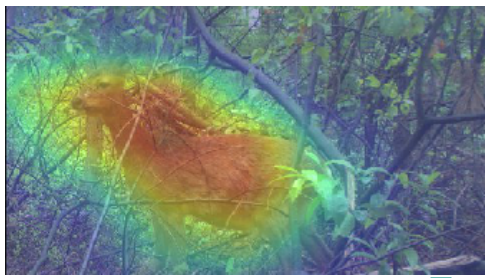
Zhou et al. (2016)

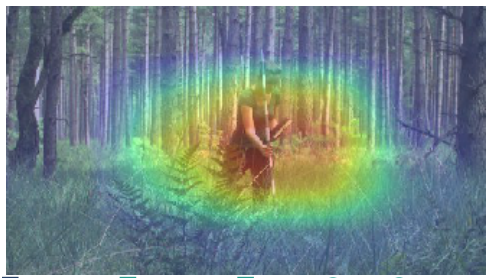
Class activation mapping



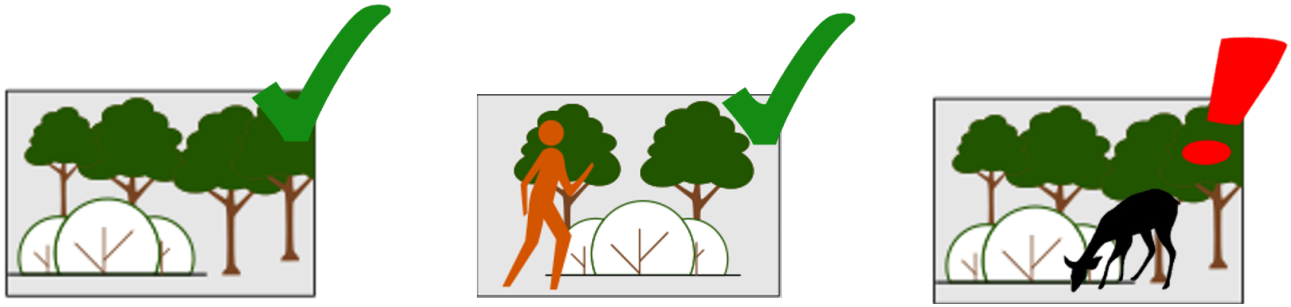
Zhou et al. (2016)







Conclusions and future perspectives



- **More data**
- Extensive training
- Sequence classification
- Multiple species

Acknowledgments

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- KERMIT: Laura Hoebeke, Michiel Stock & Bernard De Baets
- INBO: Stijn Van Hoey & Jim Casaer